Sustainable Water Resources Roundtable
Preliminary Report

September 30, 2005

ACKNOWLEDGEMENTS

The Steering Committee of SWRR thanks the following organizations for their support of our work and meetings:

Advisory Committee on Water Information (ACWI)
Alice Ferguson Foundation
American Water Resources Association
Bureau of Land Management (Dept. of the Interior)
Bureau of Reclamation (Dept. of the Interior)
Council on Environmental Quality
Ecological Society of America
Electric Power Research Institute
Environmental Protection Agency
Fish and Wildlife Service (Dept. of the Interior)
Illinois State Water Survey
Minnesota Environmental Quality Board
Natural Resources Conservation Service of USDA
National Oceanic & Atmospheric Administration
Universities Council on Water Resources
University of California, Santa Barbara
University of Michigan, Ann Arbor
US Department of Energy
US Dept. of the Interior, Office of the Secretary
US Forest Service of USDA
US Geological Survey (Dept. of the Interior)
Water Environment Federation
Western Pennsylvania Watershed Program

Special mention also of individuals who donated significant personal time to the work of the roundtable:

R. Warren Flint
Cheryl Little
Ethan T. (Tim) Smith

Principal Contributors to the Report

Hundreds of participants of the SWRR offered presentations, ideas and comments at many SWRR meetings that laid the groundwork for this report. Among the direct contributors to this report were:

John Wells, Minnesota Environmental Quality Board
Rhonda Kranz, formerly Ecological Society of America
Stephen Gasteyer, Univ. of Illinois Urbana-Champaign
Bob Goldstein, Electric Power Research Institute
Ted Heintz, Council on Environmental Quality
Al Steinman, Annis Water Resources Institute
John Dawes, Western Pennsylvania Watershed Program
Paul Barlow, US Geological Survey
Warren Flint, Five E's Unlimited
Paul Freedman, Limno-Tech Inc.
Toni Johnson, US Geological Survey
Tim Smith, SWRR Coordinator
David Berry, SWRR Manager
Rick Swanson, US Forest Service

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Sustainable Water Resources Roundtable (SWRR) brings together participants from diverse sectors – federal, state, corporate, non-profit, and academic – to advance knowledge and support the decision-making needed to sustain the quality and availability of the nation's water resources. In the large context of sustainability, water plays a central role and many government and private organizations have responsibility for or interest in water resources. All aspects of our society, economy and ecosystem are highly dependent on these resources. No organization addresses the full spectrum of water resource topics and it was this fragmentation of responsibility as well as the commonality of interest that led to the formation of the SWRR.

Just as the participants in the SWRR represent a wide range of interests and responsibilities related to water resources, we hope that this report is useful to a wide audience including organizations responsible for management of water resources, organizations that depend on them and individuals and organizations that are researching the field. The report is not designed to be highly technical but some of the relationships in the systems in which water is a part are indeed complex.

The SWRR is one of four natural resource roundtables advising the efforts of the White House Council on Environmental Quality to develop a comprehensive set of national environmental indicators. The other roundtables address critical issues and indicators for the management of forests, rangelands, and minerals and energy. The SWRR is also a subgroup of the Advisory Committee on Water Information (ACWI), which advises federal agencies responsible for managing water resources.

The SWRR has hosted multi-stakeholder meetings on research needs and indicators from December 2002 through June 2005 in California, Maryland, Michigan, Minnesota, Virginia, and Washington, D.C. The SWRR receives funding from public agencies and the private sector.

Contents of This Report

This report includes chapters on the role of indicators, conceptual foundations for the work of the roundtable, and criteria and indicators on the sustainability of water resources. The report also covers the research needs for sustainable water resources management that were discussed at the SWRR meetings and covered in depth at a workshop held at the University of Michigan in April 2005. The final chapter discusses conclusions, recommendations and future work, as well as how the federal and state governments, the private sector and non-profit organizations can help to achieve the sustainability of water resources. The appendices present a discussion of the water budget approach to management, a full list of candidate indicators and the terms of reference (bylaws) of the SWRR.

Defining Sustainability

The most widely known definition of sustainable development was put forth by the Brundtland Commission in 1987 as development that “meets the needs of the present without compromising

the ability of future generations to meet their own needs." Sustainability is a complex subject and clear definitions of key terms such as sustainability, stability, equilibrium, limits, thresholds, and needs can enable a common understanding. Rather than choosing a strict definition of sustainability all the multiple SWRR partners could agree on, whether the Brundtland definition or developing an alternative, the SWRR agreed to propose a set of four sustainability principles for water resources management:

1. ***The value and limits of water***. Water resources are the basis of life and provide great value. While water is abundant, people need to understand and appreciate the limits of water resources in many regions, the environmental and economic costs of damaging water resources, and the risks to people and ecosystems of unbounded water and land use.

2. ***Shared responsibility***. Because water does not respect political boundaries, its management requires shared consideration of the needs of people and ecosystems up- and downstream and throughout the hydrologic cycle.

3. ***Equitable access***. Sustainability suggests fair and equitable access to water, water dependent resources and related infrastructure.

4. ***Stewardship***. Managing water to achieve sustainability challenges us, while meeting today's needs to address the implications of our decisions on future generations and the ecosystems upon which they will rely.

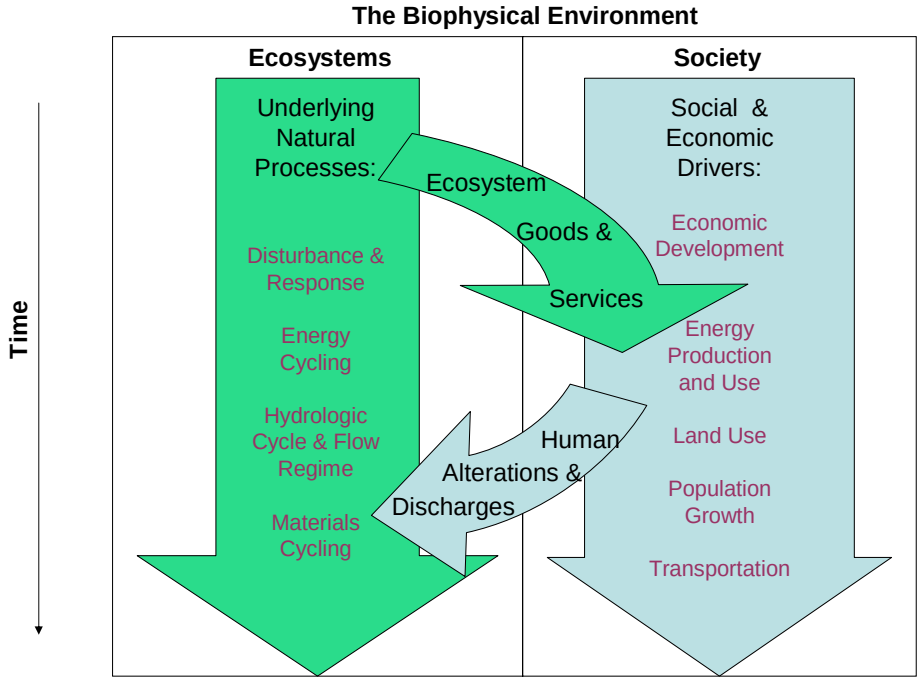
The discussion of the sustainability of water resources occurs within the context of the major driving issues of population, income, land use, climate change, and energy use. All of these key drivers affect water allocation through the demands for various uses. In some cases, the water resources themselves may be changed by major shifts in these drivers. For example, with climate change, we could see increased salt water intrusion into freshwater resources because of more frequent storms and possible sea level rise.

Representing Sustainability With Systems Concepts and Indicators

The sustainable development of water resources is a multi-dimensional way of thinking about the interdependencies among natural, social and economic systems in the use of water. The SWRR used systems concepts to represent our understanding of "how the world works." In the case of water resources, systems concepts represent those components and processes in our world by which water moves from place to place, interacts with other components of the ecosystem, and is used by humans. Understanding these components and processes is essential to identifying key indicators. We define indicators as measures that present relevant information on trends in a readily understandable way. Indicators can be presented in the form of numbers, charts, graphs, or maps. A good indicator sends society an important signal.
Figure ES.1 displays the overall relationships among ecosystem and society encompassed by the concept of sustainability. The view that sustainability is a property of the biophysical environment that emerges from interactions between the ecosystem and society is attractive to experts and managers in many fields. Ecosystems include all living things on Earth and the non-living systems with which they interact and on which they depend. Society includes all the

human elements of the biosphere. Humans are a part of nature, not apart from it. The economic system is a part of the social system.

Figure ES.1
General Framework for Driving Forces and Underlying Processes



By offering a framework or system for organizing and communicating data, we can bring to light useful knowledge at whatever scale is needed by decision-makers. The framework itself provides a simple way to communicate complex interrelationships.

One way to apply the systems concepts of sustainability to identify effective indicators is to recognize that sustainability can be achieved by maintaining capital or capacities of all forms to meet various human and ecosystem needs within the biosphere. Economists regard capital as the capacity to produce a flow of value over an extended time – value that is produced by satisfying human needs. Although capital is a term most often identified with economics, it is also used for other types of analysis. All three systems – natural, social and economic – produce flows of services, experiences or goods that meet various needs over time. In this sense, all three systems contain capital. As a result, good indicators measure this capital as well as the direct and indirect impacts caused by changes in capital over time.

Summary

The goal of the sustainability indicators in this report is to tell us "where we are" in the quest for meeting short- and long-term social, economic and ecological needs with respect to water resources in the midst of a constantly changing ecosystem and the dynamics of human society. Indicators highlight important trends and help us begin to evaluate their causes and effects. They educate people and build awareness about the challenges we face. They give us a common language that allows us to share a deeper understanding of issues and forge the collective responses that every level of society must take.

The roundtable believes effective indicators will enable people in every watershed and community to gain new understanding and tools to make good decisions. And an informed citizenry may give the nation the best chance to ensure that its management of water resources is sustainable.